meters, we have the following remarkable data. Class A contains 49 ascensions of manned balloons, and gives a temperature fall of 20.8° at the 5,000-meter level; class B contains 12 upward and 5 downward trips of manned balloons and gives a fall of 25.5° at the 5,000-meter level, or 5° more than class A; class C contains 12 ascensions of unmanned balloons, with a fall of 32.3° at 5,000 meters, or 11.5° more than in class A, and 57° at 9,000 meters, or 9° more than in class B. This class shows also a fall of 60.6° at 10,000 meters and 60.4° at 16,000 meters. These widely different temperature falls by classes A, B, C may possibly be explained by those who are familiar with the circumstances, but the fact deserves attention; also the other fact that there is no temperature fall between 10,000 and 16,000 meters as observed in the Berlin unmanned balloon ascensions. In column D is given the result of my own compilation found by taking the mean of all the figures as they stand in Tables 156, I, II; and on fig. 21 the line D is seen to fall between A and B and to cross C at the height of 12,000 meters.

In his review of the Berlin ascensions H. Hergesell gave the Berson results as shown as in column E, the Teisserenc de Bort results as in column F, and his own results as in column G. He also stated the conclusion that above 10,000 meters the adiabatic rate of temperature fall in free air prevails, and this may be considered as 9.0° per 1,000 meters, as suggested by him. Column I is the mean value of E, F, G, up to 10,000 meters, and from that level to 16,000 the fall is calculated at 9.0° per 1,000 meters, these values being plotted on fig. 21. Finally, by taking the means of the data given in Tables 157, I, II, which was derived from Charts 78, 79, as constructed to determine the gradients for each month in the year, we have the data of column H, also plotted on fig. 21. It is seen that my adopted result, H, lies midway between A and B, and is a fair average of all the ascensions taken in the unmanned balloons, while the adopted Berlin result, I, is 45° lower at 16,000 meters, giving at that level a temperature of —115° approximately. There is a further consideration of importance to be noted in this connection. E. Rogovsky in his paper on the "Temperature and composition of the atmospheres of planets and the sun," Astrophysics, November, 1901, discusses the temperature of the interplanetary medium (according to Pouillet —142° C., Froelich —131° to —127°), and assumes it to be —142° C. A fair assumption regarding the efficient depth of the atmosphere makes it 64,000 meters or about 40 miles, and hence we have the following data:

Height of atmosphere.	Bigelow.		Berlin.	
	Temperature.	Necessary gradients.	Temperature.	Necessary gradients.
Meters.	° *C.*	° *C.*	° *C.*	° *C.*
64,000	—142	....	—142	....
		—1.8	....	—0.9
16,000	— 55	....	—100	....
		—4.4	....	—7.2
Surface	15	....	15	....

If the temperature falls from 15° at the surface to —55° at 16,000 meters with a gradient of about —4.4° per 1,000 meters, then to reach —142° at 64,000 meters the gradient should on the average be —1.8°. It will be seen by my Charts 78 and 79, International Cloud Report, that I adopted an increasingly slower temperature fall with the height in the strata above 10,000 meters, in accordance with this general view. If the Berlin theory is assumed that a fall of 9.0° per 1,000 meters prevails above the 10,000-foot level, then it must somewhere rapidly decrease to a very small gradient in order not to diminish the exterpolated temperatures far below that value assigned by certain astrophysicists to the celestial medium at the earth's distance from the sun. In fact the gradient becomes one-tenth of the adiabatic rate, which was actually assumed.

If the temperature —260° C. is that of the interplanetary medium, as supposed by other writers, these inferences must be modified accordingly.

From these two considerations,(1) that my temperature system includes the data of the highest balloon ascensions, and (2) that my gradients are in harmony with the requirements of astrophysics, I shall let my computations on the heat difference between the adiabatic and the actual atmosphere stand as they were given in my report. The accurate measurement of the temperatures in the highest strata is a very difficult process, and all efforts to secure reliable results deserve the hearty support of meteorological physicists. There are several problems whose solution depends upon the possession of such data in a satisfactory form.

THE FIRST NATIONAL METEOROLOGICAL CONGRESS OF MEXICO.[1]

By Prof. FRANK H. BIGELOW.

The report of the proceedings of the first Meteorological Congress of Mexico has been published and contains the acts and resolutions and papers presented during the sessions of November 1, 2, 3, 1900, held under the auspices of the Scientific Society "Antonio Alzate." The president was Señor D. Manuel Fernandez Leal, and there were about thirty members present at the sessions in an official capacity, The proceedings opened at 9:20 a. m., Thursday, November 1, 1900, with an address by the President, after which the papers to be read were presented. In the afternoon the session opened at 3:35, C. A. Gonzalez presiding, at which a discussion and the adoption of resolutions occurred, the purpose being to indicate the necessary steps in the organization of a national meteorological service for weather forecasts and climatology along recent modern lines, as laid down by the International Meteorological Congresses. Also a report was approved on the formation of a survey of the atmosphere by cloud observations, in three classes: (1) direction and motion of clouds by eye, (2) by nephoscopes, (3) by theodolites and photogrammeters.

On Friday, November 2, at 9:20 a. m., F. R. Rey presiding, papers were read by S. Diaz, L. G. Léo, M. Moreno y Anda, Señorita R. Sánchez Suárez, and J. M. Romero. At 4:30 p. m., D. M. Leal presiding, resolutions were passed as to the hours of observation, reduction of temperatures to the mean of 24 hourly observations, computation of the vapor tension, reduction of the barometer to zero temperature and to sea level, classification of clouds, the computation of the mean direction of the wind, and as to various special observations.

On Saturday, November 3, at 9 a. m., G. B. y Puga presiding, the reading of papers was continued by A. Prieto, Leal, and Olmedo. A discussion took place with the adoption of the following resolutions:

The first National Meteorological Congress expresses its desire that the Federal Government should provide for the organization of a meteorological service upon a basis analogous to that which exists in the United States; especially, will it be desirable to secure a modification of the existing services, taking account of the elements which actually exist, in comformity with the following principles: (1) That the Central Meteorological Observatory of Mexico be recognized as the central office of the national service; (2) that it be the center of all the scientific relations; (3) that the Federal Government equip this office for that work; (4) that the government establish and equip other observatories in suitable localities for cooperation with it; (5) that the state governments organize a network of stations in their own districts; (6) that a suitable telegraphic service be developed for meteorological messages; and (7) that a commission be organized to further the development of these plans.·

At 4:30 p. m., J. de M. Tamborrel presiding, the discussion was continued, and resolutions were adopted concerning the

publication of meteorological observations in daily, monthly, and annual reports; the forms for the record of the observations; the symbols for meteorological phenomena; the self-registers and their reduction to standard, and the commencement of the meteorological year on the first of December. It was further recommended that observations be conducted on earthquake phenomena, that the atmosphere be explored with balloons, that the ozone of the air and the formation of clouds be studied. Provision was made for the second congress in the following year. This congress met in the same place on December 17, 18, 19, and 20, 1901. The prospectus has already been published in the MONTHLY WEATHER REVIEW, page 512, November 1901, and a résumé of the proceedings will be found on page 132 of the REVIEW for March, 1902.

All meteorologists will be gratified to see these evidences of activity in Mexico, and especially will they appreciate the fact that the movement to establish a National Mexican Service is going forward along the most approved lines. It is evident that the leaders are planning to conform to the resolutions of the International Meteorological Congress generally, and also to keep in touch with the practical system of the United States Weather Bureau, as far as possible. It is extremely important that the Mexican Plateau should be placed under a strictly scientific régime as promptly as can be done, and that a common network of stations and telegraphic exchanges be instituted between the United States and Mexico, such as has long existed between the United States and Canada.

NOTE ON THE OSCILLATION PERIOD OF LAKE ERIE.

By R. A. HARRIS, U. S. Coast and Geodetic Survey, dated June 27, 1902.

In a paper recently issued by the Weather Bureau entitled Wind Velocity and Fluctuations of Water Level on Lake Erie, the author, Prof. Alfred J. Henry, finds the theoretical period of oscillation for the lake to be about eighteen hours; he notes that observations made at Buffalo and Amherstburg indicate a period of fourteen hours, or a little more. In determining this 18-hour period, the lake is assumed to be isochronal with a rectangular body of water 50 feet deep and 246 statute miles long. The object of the present note is to point out how the observed period may be made to harmonize with a plausible theoretical period.

In any statement of this question which regards the depth of the lake as uniform, one can hardly assume the average depth to be so small as 50 feet; probably 60 or 65 feet is a good value.

It would be a difficult matter to ascertain mathematically the free period of a body so irregular in outline and so variable in depth as Lake Erie. Nevertheless, the following approximation appears to be useful. Consider a square area oscillating in the manner shown in the accompanying fig. 1. We can imagine thin partitions to be erected along the lines of motion and the oscillation will go on as before. That is, any one of the pointed areas will have a free period of oscillation the same as that of the square. They are isochronal with a rectangle whose length is equal to a side of the square, although their common least length is the square's diagonal, or $\sqrt{2}$ times the length of a side. If, therefore, Lake Erie be represented by a leaf-like figure composed of several of the pointed areas, Maumee Bay marking one end and Buffalo the other, the free period of such a body would be only $1/\sqrt{2}$, or 0.7071 times the period of a rectangle whose length is this

extreme length of the lake. (See U. S. Coast and Geodetic Survey Report, 1900, pp. 586–589.) We can readily suppose that as a matter of fact the lake lies between the two hypothetical bodies. With a length of 250 miles and a depth of 60 feet, the mean of the theoretical period for the leaf-like figure and that for a rectangle is fourteen and one-quarter hours, which is about the observed period of the lake.

West of Sandusky the average depth of the lake is about 30 feet. This is partially separated from the eastern or main portion by several islands and shoals. If this partial boundary were made sufficiently complete it would constitute the western boundary of the oscillating body, and from this region a derived wave would progress to Amherstburg, the time of transmission being about 1.7 hours. As the highs or lows at Amherstburg are on an average, but little later than the lows or highs at Buffalo, it is probable that the oscillation extends the whole length of the lake, although its period may be slightly influenced by the partial barrier that actually exists, and by the shallowness of the western end. The great depths found between Dunkirk and Long Point must also have some slight effect upon the free period of the body.
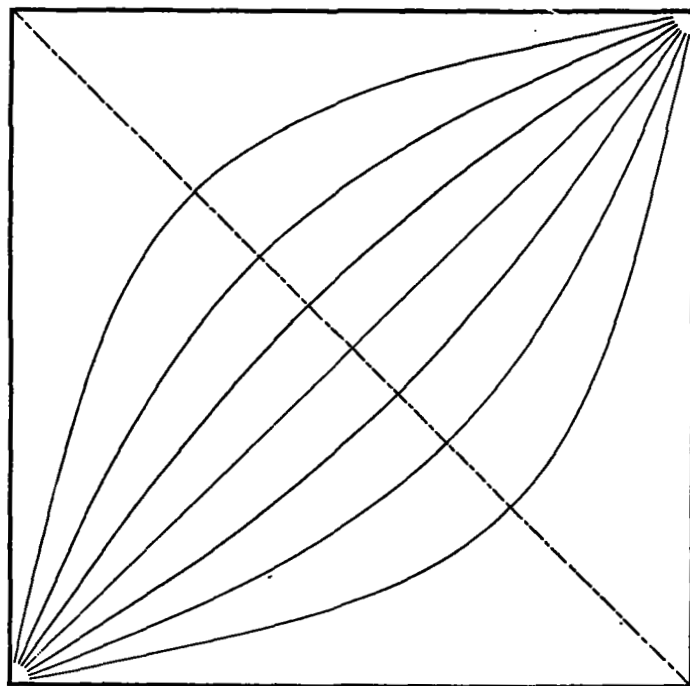

FIG. 1.

Questions connected with the oscillations of lakes can be studied experimentally by means of models suitably constructed. For, by ignoring friction the method of dynamical similarity can be applied. In practise the vertical scale of the model must generally be greater than the horizontal in order to obtain depths sufficiently great for the purpose. The only restrictions are that the maximum depth in the model shall be but a small fraction of the length, and that wherever the motion is considerable, the slopes of the bottom along the lines of motion must be small. If n denote the ratio of any horizontal distance in the model to the actual distance, and if m denote the ratio for heights (so that m/n is the ratio of the vertical to the horizontal scale of the model), then the period ratio will be $n/\sqrt{m}$.